# CNG AND LNG AS TRANSPORTATION FUELS





**Indiana Utility Regulatory Commission Natural Gas utility Forecast Winter 2012/13** 

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# U.S. DOE Clean Cities Program



#### **Mission**

To advance the energy, economic, and environmental security of the United States by supporting local decisions to reduce foreign oil use in transportation.

#### Goal

Reduce foreign oil use by 2.5 billion gallons per year

- Replacement
- Reduction
- Elimination



#### **Accomplishments**

- Saved nearly 3 billion gallons of foreign oil since 1993
- Put more than 775,000 alternative fuel vehicles (AFVs) on the road
- Installed more than 6,600 alternative fueling stations

#### Clean Cities Coalitions



- Nearly 100 coalitions in 45 states
- 775,000 AFVs using alternative fuels
- 6,600 fueling stations

#### **Clean Cities Coalitions**



#### Indiana Clean Cities Coalitions



- Greater Indiana CC
- Serving 2/3 of State
- Ranked among top 10 coalitions since 2004
- Secured over 20 million in federal and state grants for member AF, AFV and technology vehicle and infrastructure deployment
- By facilitating partnerships and projects, we will reduce our nation's dependence on foreign oil, while creating green jobs and improving air quality in Indiana

South Shore CC
 Carl Lisek

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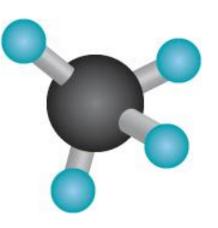
# Natural Gas Chemistry 101



#### **Natural Gas**

- Hydrocarbons, predominantly methane (CH<sub>4</sub>)
- High octane rating
- Nontoxic, noncorrosive, and noncarcinogenic
- Not a threat to soil, surface water, or groundwate
- Lower ozone-forming emissions than gasoline





# Sources and Supply



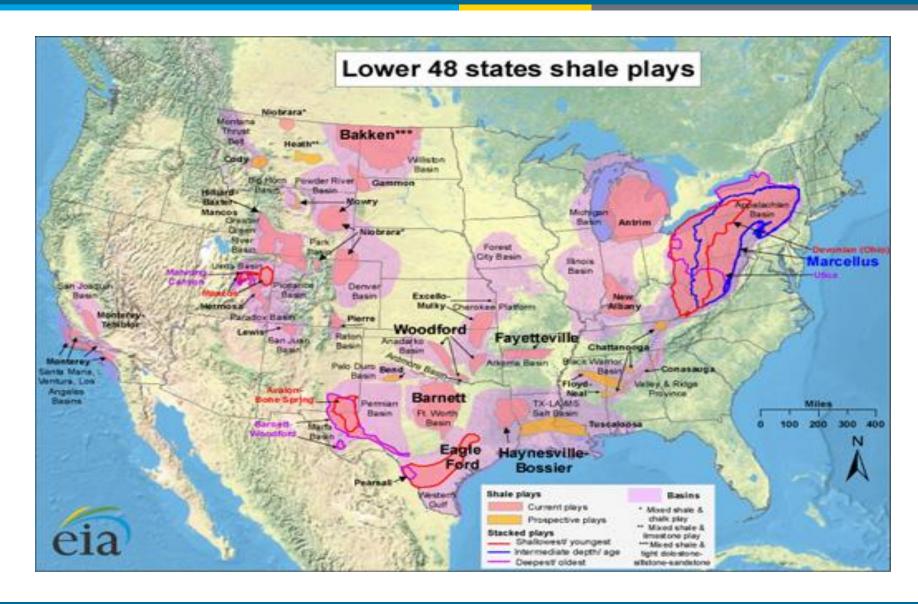
#### **Natural Gas**

- 80% to 90% of the natural gas used in the U.S. Is domestically produced
- Most natural gas is drawn from wells or in conjunction with crude oil production
- Smaller amounts are available through coal and biomass processes
  - RNG
- Natural gas can also be produced from subsurface porous rock; shale
  - Fracking Process



# **Natural Gas Supply**





# On-Board Vehicle Storage: CNG and LNG



#### **Compressed Natural Gas (CNG)**

- Stored in onboard tanks under high pressure 3000 – 3600 Psi
- Fuel economy similar to gasoline
- 1 GGE = 5.7 lb CNG

#### **Liquefied Natural Gas (LNG)**

- Kept at cold temperatures
- Stored in double-wall, vacuum-insulated pressure vessels
- Heavy-duty vehicles
- 1 GGE = 1.5 gal LNG



National Average \$: 07/12

Natural Gas (CNG) \$2.05/GGE (LNG not reported)

Gasoline \$3.52/gallon

Diesel \$3.75/gallon

## **Basics: Natural Gas Vehicles**



#### **Dedicated**

L/CNG Only fuel system

#### **Bi-fuel**

Two fuel systemsL/CNG or Diesel

#### **Dual-fuel**

- Blend/injected
  - Diesel
  - L/CNG



# : CNG/LNG Vehicle Options



- Natural gas powers approximately 112,000 vehicles in the U.S.
- Roughly 14.8 million worldwide



**Photos Courtesy of NREL/DOE** 

# Fleet Applications



# **Light-Duty NGVs**

Suitable for all light-duty needs

## **Medium-Duty NGVs**

- Vans and shuttles
- Airport and taxi fleets

## **Heavy-Duty NGVs**

- Refuse haulers
- Transit buses
- School buses
- Long-haul trucks
- Street sweepers
- Snowplows
- Short-haul delivery trucks



Natural Gas Vehicles for America www.ngvamerica.org

# Fueling Stations: CNG and LNG



#### Offsite, Public Access

- Utilize an existing public station
- Operated by retailer, utility, or fleet
- Anchor fleet or pool of multiple fleets

#### **Onsite, Private Access**

- Exclusive use by fleets
- Time-fill stations always private access

## **Onsite, Public Access**

- Often located outside of restricted areas
- Benefit from economy of scale
- Promotes public use of NGVs
- Must have fast-fill capabilities for public





# Station Ownership and Operation



## Fleet-Owned and Operated

- Fleet works with vendors on station development
- Fleet owns and operates station

## **Outsourced to Independent Provider**

- Outside development, ownership, and operation
- Fleet provides demand threshold
- Long-term price agreement
- Public access possible

# Fleet-Owned, Contractor-Operated

- Reduces fleet risk
- Fleet relies on experienced operator
- Usually a 3 5 year contract



# **CNG** Fueling



# **Time-Fill Fueling**

- Good for centrally-based fleets with consistent sc
- CNG is dispensed slowly, often overnight
- Lower cost investment

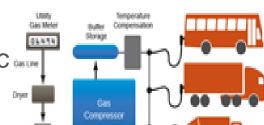
## **Fast-Fill Fueling**

- Fueling takes place in minutes
- Necessary for public-access stations
- Good for vehicles with little downtime

# **Combo-Fill Fueling**

- Time-fill and fast-fill
- More flexibility in fueling

# **Home Fueling Units**



Time-FIII Station





# LNG Fueling



- Structurally similar to gasoline and diesel stations
- Both deliver a liquid fuel
- Dispensers fuel vehicles at pressures of 75 -120 PSI
- LNG is stored/dispensed as a super-cooled, liquefied gas, protective clothing and gloves are required when fueling

There are many safety guidelines that need to be considered

when developing infrastructure



# CNG fueling in Indiana and Across U.S.



- CNG Fueling Existing
  - 165 CNG Corridor
    - AMP Americas 2
    - Stations in Indpls 3
  - Evansville
  - Crawfordsville Exit and 74
- Under Discussion
  - Ft. Wayne Vincennes
  - Lafayette Richmond
  - IAA– Ft. Wayne
  - Lawrenceburg



## LNG in Indiana and Across U.S.



# Indiana Fueling Proposed

- Clean Energy LNG/CNG
- SR37 and I465
- Plainfield
  - TBD

- Across U.S. 29
  - CA 14
  - Nevada 1
  - Utah 2
  - TX 3
  - -LA-1
  - -AL-1
  - WI 1
  - -OH 1
  - CT 1

#### For More Information



Greater Indiana Clean Cities Coalition www.greaterindiana.com

U.S Department of Energy Clean Cities Program www.cleancities.energy.gov

Alternative Fuels & Advanced Vehicles Data Center (AFDC) <u>www.afdc.energy.gov</u>

Alternative Fuel Vehicle (AFV) Decals (Reference Indiana Code 6-6-2.1-203 through 6-6-2.1-206)

http://www.afdc.energy.gov/laws

#### THANK YOU





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